



High End Computing and Computation (HECC) Working Group

**Advisory Committee on High-Performance Computing and
Communications, Information Technology, and the Next-Generation
Internet**

Co-Chairs:

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Nation Needs High End Computing

- Maintain U.S. leadership in high-end computing (HEC)
- Support critical federal government mission needs
 - national security
 - weather modeling, disaster warning & relief
 - aeronautics and space exploration
 - energy research
 - basic science and engineering
- Promote insertion of HEC in U.S. industry sector for U.S. competitiveness
- Promote broad societal applications
 - healthcare
 - education and lifelong learning
 - long-term environment and energy management
 - human services



HECC R&D Objectives

- **Short Range (< 5 yr.)**
 - Develop tools & system software for use on distributed, high-end systems
 - scalability
 - throughput
 - speedup
 - portability
- **Long Range (> 5 yr.)**
 - Support research and technology necessary for petaFLOPS computation & exabyte-level mass storage
 - software
 - architecture
 - algorithms
 - component technology



HECC R&D Scope

- System software and tools
- Application development environments
- Fast, efficient algorithms for simulation, modeling and visualization
- System architectures
- Device technologies
- Interconnection technologies
- I/O, and multi-level data storage
- Laboratory demonstration prototypes
- Advanced simulation of physical phenomena and other grand challenge applications



Foundations for the HECC R&D Program

- Expert community assessments, findings and recommendations
 - System software Workshops
 - PetaFLOPS Workshops
 - Conferences and scientific meetings
- Computer industry forecasts, planning and positions
- Inter-agency Task Force reports and planning



HECC Thrusts

- System software research for high end computing
 - National HPCC Software Exchange
- Leading-edge research focused on next-generation computing
 - Innovative technology
 - Laboratory demonstration prototypes
- Incorporation of technologies into real applications
 - Computational science
 - Grand Challenge teams
 - Algorithm research
- Infrastructure for research
 - Research facilities (PACI, NERSC, testbeds, equipment)
 - Mission programs procure large scale systems
 - Large-scale networking infrastructure is required

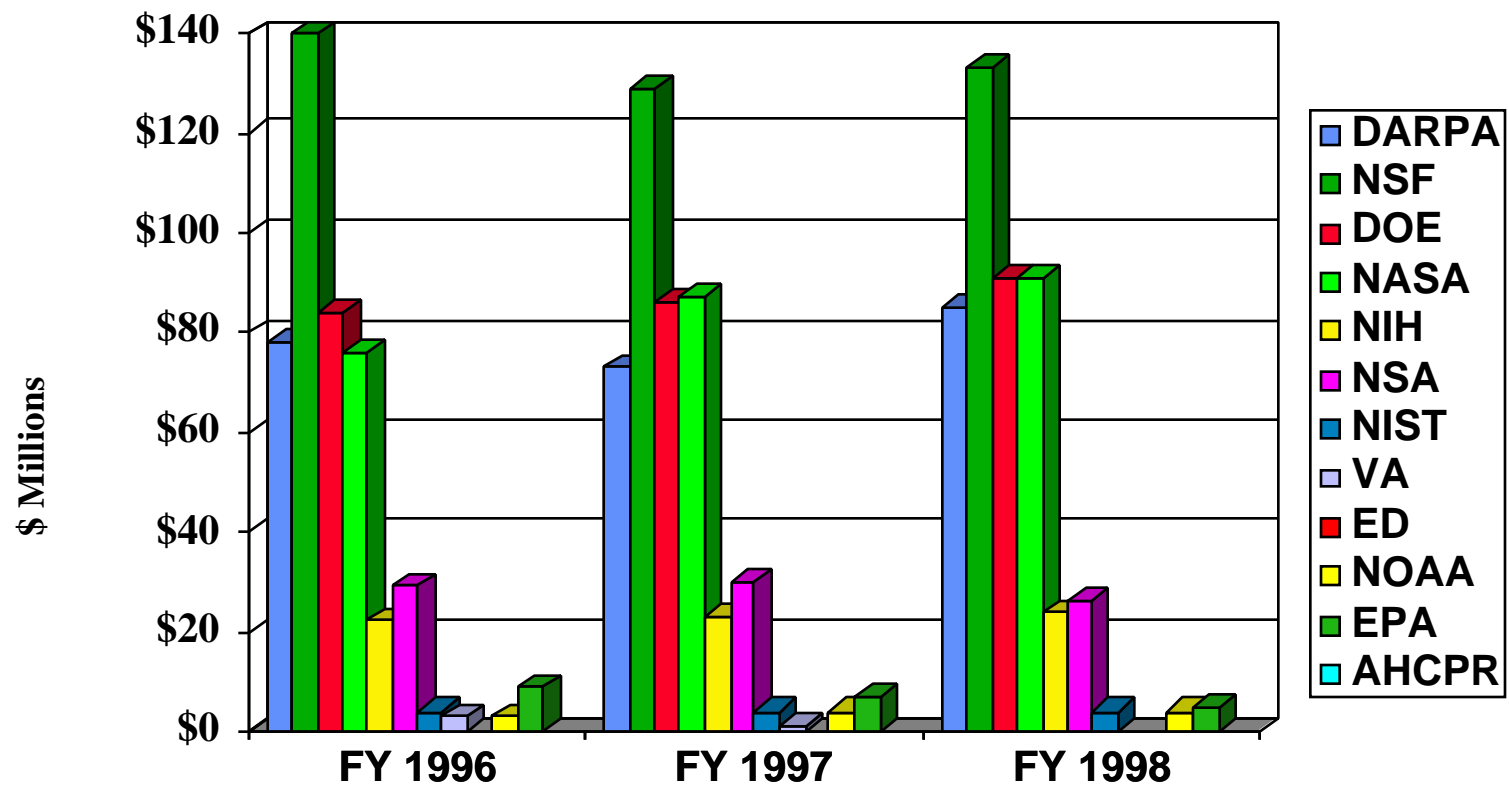


System Software Research Thrusts

- Languages and compilers
- Debugging and performance tools
- Programming interfaces and libraries
- Operating systems
- Scientific visualization and data management
- Software tools infrastructure
- Support for I/O
- System software goals (5 years):
 - scalability
 - logarithmic or better
 - speedup
 - 50% of ideal
 - portability
 - all major vendors
 - performance
 - 100-fold improvement in time-to-solution over FY96 baseline



High-End Computing and Computation Budgets





HECC Issues

- Federal Role in High-End Computing and Computation
- Federal High-End Computing Acquisition Policy
- Fostering Scalable, Portable Software Development, Commercialization and Distribution
- Promoting Rapid Transfer of High-End Computing Technology to Benefit US Industry and Society